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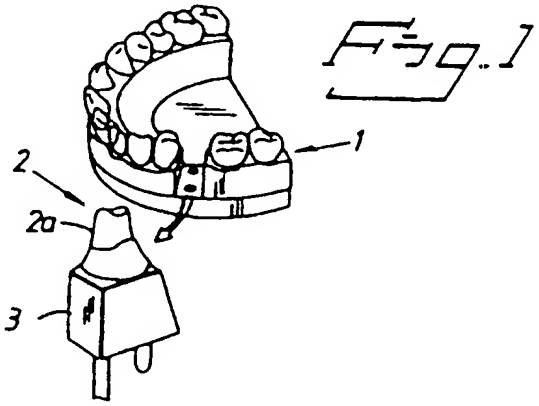
## (54) Process and device in connection with the production of a tooth, bridge, etc.

(57) In the production of a tooth or bridge, for example, an outer contour of a rotating model is scanned by means of a scanning device (6). The model is mounted in or on a rotary holder (5) for the model. The latter is supported by the holder such that the scanned contour, above a preparation line on the model, can be exposed to the angled scanning device. This is directed towards a surface situated on the model below the preparation line. The holder is activated for rotation and the scanning device is activated for contour scanning. During the scanning, the scanning device and the holder are assigned a reciprocal movement in the vertical direction.

It is proposed that Figure 2 should accompany the abstract.

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## TECHNICAL FIELD

The present invention relates to a process for scanning, in connection with the production of a tooth, bridge or similar product usable on the human body, an outer contour of a rotating model by means of a scanning device which operates at a scanning angle, e.g. 45°, relative to the rotational axis of the model. The invention also relates to a device for making the said process possible.

## PRIOR ART

By virtue of Swedish patent 9003967-8 (468 198), it is previously known to carry out a scanning or reading function on a rotating model, in which a scanning device is set at an angle (45°) relative to the rotational axis of the model. The reading is utilized in a computer installation for the further processing of input data and production of the product in question, which is primarily constituted by a tooth, bridge or other dental three-dimensional body.

## DISCLOSURE OF THE INVENTION

## TECHNICAL PROBLEM

The entire production process in respect of formulated or desired products must be executed such that a relatively very high manufacturing accuracy is accomplished, in connection with which it may be mentioned that in many cases an accuracy of 0.01-0.05 mm is required. This places high demands upon, inter alia, the capacity of the reading function to be performed with great accuracy.

The reading should be able to be performed by the average dental technician or practising dentist without the need to acquire over-extensive special skills as regards data-processing equipment. The invention aims to solve, inter alia, these problems and proposes a tool which is easy to learn to use and implement together with normal tasks performed by the dental technician/dentist.

There is a requirement for the reading to be able to be performed with necessary accuracy on the spot, entirely separate from the actual manufacture of the product in question. The dentist/dental technician should be able individually to perform a data-storage and data-transfer to the manufacturer. The invention solves this problem too.

The new tool should be able to operate on the basis of the principles, hitherto practised, as regards the formulation of the preparation model. The tooth preparation should be able to be separated from a plastic cast in a manner which is well known per se and then utilized in the reading function. The invention solves this problem too and enables the dental technician/dentist to retain the model during its manufacture, which model does not therefore need to be physically sent away to some manufacturer.

The dentist/dental technician should be able to perform final adjustments to a produced crown or equivalent. The invention solves this problem by virtue of he or she being able to have quickly performed, as an intermediate step, a production or manufacture of a product corresponding to the model.

The tool for the dental technician/dentist should involve the utilization of conventional data-processing equipment currently on the market and a reading function which is technically simple from the handling aspect. The invention solves this problem and proposes a specially adapted reading apparatus which is easy to handle. In addition, the utilization of a conventional personal computer installation (e.g. an IBM-compatible PC of the 386 type or higher capacity) is made possible. The personal computer preferably comprises a built-in modem, by means of which read files can be transferred to the manufacturer via the public telecommunications/data network. The equipment is simple to connect.

## SOLUTION

The feature which can principally be considered to be characteristic of a process according to the invention is that the model is mounted in a rotary holder for the model and the model is supported by the holder such that the scanned contour, above a preparation line on the model, can be exposed throughout to the angled scanning device. The process is additionally characterized by the fact that the scanning device is directed towards a surface situated on the model below the preparation line and by the fact that the holder is activated for rotation and the scanning device is activated for contour scanning. During the contour scanning, the scanning device and/or the holder are/is assigned a movement in the vertical direction of the model.

In embodiments of the inventive concept, the model is installed in a fixture in which the model is adjusted in two mutually perpendicular directions located in the same plane, thereby enabling the model to be centred

relative to the rotational axis of the holder. In addition, a member (parallel pin) can be utilized, which can be disposed parallel with the rotational axis and can be brought into interaction with the model material at the preparation line when the model assumes its position in the fixture. The position of the model in the fixture is in this respect such that the said contour is placed or comes between the member and the rotational axis without negative recesses and reading shadows. The fixture is placed on the holder, e.g. a turntable, and centred using centring members. The contour is read preferably by means of a reading member exhibiting a spherical front surface (so-called probe), which is brought to bear against the surface located below the said preparation line and against the said contour.

The scanning member can be brought into physical contact with the said surface below the preparation line. The physical contact remains until the scanning member, in its scanning function, has reached the upper part of the model, where the scanning member is assigned an action or a return movement which results in the cessation of the interaction of the scanning member with the model contour. The holder or scanning member can be assigned a movement in the vertical direction of the rotational axis during the scanning function. When the scanning of the contour is completed, a respective unit which is movable in the vertical direction is assigned a return movement to the starting position.

Both the model and a sleeve (cap) which can be fitted to the model can be scanned using the scanning device. The model can be scanned first and, thereafter, the sleeve fitted to the model. In order to avoid disturbing the set values of the model, the sleeve can be fitted with great accuracy, in respect of which glue or some other adhesive material can be utilized. With the double reading, the inner surface (corresponding to the outer surface of the model) and outer surface of the sleeve are fixed and data-stored.

A device for implementing the said process according to the invention is characterized principally in that a holder is arranged to support the model such that the contour of the model above a preparation line on the model can be exposed throughout the reading or scanning from the angled scanning device. The scanning device can be adjusted, at the start of the scanning function, against a surface situated below the preparation line. The holder can be activated for rotation and the reading device can be activated for contour scanning. The scanning device and the holder are arranged to perform reciprocal movements in the vertical direction of the model during the scanning function.

In one embodiment of the inventive concept, the scanning device is assigned a return movement when the scanning device has completed its contour reading, which return movement results in the cessation of a physical interaction between the scanning device and the model. The scanning device and holder respectively can likewise be assigned a return movement when the contour scanning is completed.

In accordance with the inventive concept, the preparation model which can be read using the scanning device should be configured with a clearly marked preparation line or preparation boundary, below which there is preferably configured an indentation of no less than about 1 mm in height, calculated in the vertical direction of the model, and having a depth of no greater than about 1/2 mm.

## ADVANTAGES

By virtue of the abovementioned proposals, a tool is provided which is easy to handle for the dental technician and dentist concerned. The equipment is computer-based. Despite the fact that this is a relatively new technique within dental technology, the above-mentioned proposals mean that the equipment can normally be incorporated into the ordinary working tasks of the dental technician and dentist, respectively, in connection with the provision of replacement dentures. The high level of accuracy which is sought can be satisfied throughout the production system for the particular product. The reading function can be performed in isolation relative to the rest of the production and can result in the delivery of the data-values to the manufacturer. Standardized products as regards computer equipment, modem, etc. can be utilized in this context.

## DESCRIPTION OF THE FIGURES

A presently proposed embodiment of a process and a device exhibiting the characteristics which are indicative of the invention will be described below with simultaneous reference to the appended drawings, in which:

| | |
|---|---|
| Figure 1 | shows a casting, e.g. in plastic, of a jaw with teeth and a preparation model taken from this, in perspective section from above, |
| Figure 2 | shows a scanning device from the side, |
| Figure 3 | shows parts of the device according to Figure 2, in enlarged representation, |
| Figure 4 | shows parts of the scanning device according to Figure 2, from the side, |
| Figure 5 | shows a personal computer installation which can be used together with the scanning de- |

vice according to Figure 2, in perspective section from above,

Figure 6 shows the embodiment of the preparation model according to Figure 1, in perspective section from above and in enlarged representation,

Figure 7 shows parts of the preparation model according to Figure 6, in longitudinal section,

Figure 8 shows, in greater detail, a fixture for the preparation model, which fixture can be applied to the holder, in perspective section from above,

Figure 9 shows the fixture according to Figure 8 as it is adjusted in a direction which is essentially perpendicular to the direction indicated in Figure 8,

Figures 10-10a show preparation models which are usable and non-usable, respectively, in connection with the rest of the equipment, in perspective section from above,

Figure 11 shows the fixture according to Figures 8 and 9 applied to the holder, in horizontal view,

Figure 12 shows centring of the fixture and preparation model on the holder, in perspective representation,

Figure 13 shows an interaction function between the scanning device and the preparation model mounted in the holder,

Figures 14-15 show menus on computer screens in connection with the scanning process, and

Figure 16 shows the interaction of the scanning device with the model, in which a sleeve (cap) is applied to the model, in perspective section from above.

## DETAILED EMBODIMENT

In Figure 1, a conventional casting of a human jaw is indicated by 1. From the model there is extracted, in a known manner, a preparation 2, which is to be read with respect to its contour 2a. The model is disposed on a holding part 3. The casting 1 can be made in plastic, plaster, etc.

Figure 2 shows a scanner 4 which is provided with a holder 5 and a scanning device 6. The holder is disposed rotatably around a rotational axis 6', and the longitudinal axis 7 of the scanning device is inclined to the rotational axis 6' at an angle alpha. The said angle is, in one embodiment, preferably 45°. The scanning device exhibits a longitudinally displaceable slide 8, in which the scanning device 6 is disposed. The slide is displaceable relative to the holder 5, which can be raised and lowered in the direction of the rotational axis 6'. The slide exhibits a centring part 9, which is described in greater detail below. The slide 8 is shown in Figure 3, in which the movement direction of the slide is indicated by 10. The device exhibits actuating keys 11 and 12 for the movement directions of the slide and switch-on members 13 by which the scanning function can be switched on and off. The scanning device 6 comprises a front part 14 having a spherical front surface, as described below. The scanning unit has, in one embodiment, a rod-shaped configuration and operates with a scanning function based on principles which are known per se. The scanning function can be monitored on a visual display unit, as described below.

Figure 4 shows the holder in enlarged representation relative to Figure 2. The movement directions of the holder are indicated by 15 and the rotary directions of the holder by 16. The holder exhibits a bearing surface 5a which, in the figure, is shown in two positions, one of which is shown by continuous lines, while a second position is shown by dashed lines 5a'. The scanning device exhibits actuating keys, which can be manually operated like the keys 11, 12 and 13. The actuating members for the holder are indicated by 17, 18, 19 and 20. The actuating members 17 and 18 are utilized to adjust the rotary movements of the holder in accordance with that which is stated below, whilst the actuating members 19 and 20 provide for raising and lowering movements 15, respectively, for the holder.

Figure 5 shows an example of a personal computer which can be used in the equipment and which can be constituted by an IBM-compatible PC comprising a processor of the 386 type or of a more powerful type. The computer can operate on a DOS 5.0 operating system or higher. The computer can comprise an internal modem which operates on at least two megabytes (MB). The personal computer can be equipped, in a known manner, with "mouse" function, colour screen and can exhibit an extra I/O card. The modem can be of the telephone modem type, and a Hayes-compatible modem can in this respect be used. As the communications program, a COMMUT 2.0 program from Central Point can be utilized with included software. Where scanned data is not sent by modem via a telecommunications network, the data can be sent on data files on diskette, by post or by courier.

Figures 6 and 7 show preferred embodiments of the preparation in question. The preparation 2 should thus exhibit a clearly marked preparation line or preparation boundary 2c. The contour 2a must not exhibit any recesses or negative angles above the line 2c. The model should exhibit a parallel base 2d, so that the model can be fixed in a deployed fixture, as described below. The contour should also have a shaping to prevent "shadows" being formed for the scanning member (cf. 14 in Figure 3) when this operates at a fixed angle, e.g.

45°. It is also advantageous to be able to dispose below the preparation line 2c a recess or depression, which is symbolized by the recess surface 2e. The recess should preferably exhibit a height H of at least 1 mm and a depth D of 0.5 mm or less. The shaded portion 22 in Figure 7 shows the shaping of the recess.

Figures 8-9 show the installation of the preparation 2 in or on a fixture 23, which can be applied, in turn, to the holder 5. The fixture can be configured, in a known manner, with holding members for the part 2d according to Figure 6. The fixture is in this case arranged to be able to angle-adjust the model in the directions of the arrows 24a and 24b, the tilting in the direction of the arrow 24a being managed by a manual manoeuvring member 25 and the tilting in the direction of the arrow 24b being managed by a manual member 26. The model can also be tilted, in accordance with Figure 9, in directions 27 and 27b perpendicular to the directions 24a and 24b, which directions 27 and 27b are achieved with the aid of a manual manoeuvring member 28. In accordance with the figures shown, the model can be considered to have a cardan suspension in the fixture. The model is disposed in the fixture such that no recesses and preferably no scanning shadows are formed above the preparation line. The fixture permits adjustment, according to the above, in the longitudinal and transverse directions.

In accordance with Figures 10 and 10a, a parallelometer pin 29 can be utilized. The parallelometer pin 29 is placed parallel with the rotational axis 6' of the model 2. Figure 10 shows that the contour 2a terminates upwards/inwards viewed from the preparation line 2c. In Figure 10, the pin 29 therefore bears against the material at the preparation line and all the rest of the material above the preparation line is situated between the pin 29 and the rotational axis 6'. This is not the case according to Figure 10a, which shows that the pin bears against model material 2f situated above the preparation line 2c and cannot, for this reason, be accepted.

According to Figures 11 and 12, the fixture 23 is thereafter applied to the holder 5a. The fixture is in this case installed such that a curved surface 2g of the model is directed towards a marking 30 on a ring 31 surrounding the turntable or holder 5a. The model is centred accurately with the aid of the said centring part 9 (cf. Figure 2) and a plumbline 32 disposed in the said part 9 and extending down towards the model 2.

According to Figure 13, the contour scanning is initiated by the scanning device being brought into physical contact with the model 2 via its spherical front surface 14. The bearing contact takes place against the surface 2e below the preparation line 2c. The surface 14 performs movements in the direction of the longitudinal axis 7 as the contour is scanned. A bellows-shaped part which protects the scanning function is indicated by 6a. The scanning function proceeds in the present case in such a way that the holder 5a is lowered downwards in the direction of the arrow 32 as the scanning takes place. When the spherical surface has scanned the whole of the contour 2a and has reached the top 2h of the model, the scanning device 6 is assigned a return movement in the direction of the longitudinal axis 7, where the contact with the model ceases and the latter is exposed to pickup vis-à-vis the scanning device. Following completion of the scanning, the holder 5a returns to its vertical position shown in Figure 13, etc.

The process according to the invention comprises an adjustment position of the scanning device as a starting position. In Figure 13, this means that the spherical surface 14 (probe) is adjusted as far as it will go to the right in the figure. The height of the holder or turning part 5 is vertically adjusted such that the front part of the scanning member rests against the model, approximately 1 mm below the preparation line 2c. For this adjustment, the manoeuvring members 11 and 12 or 17, 18 and 19, 20, respectively, can be utilized. It is in this respect advisable to avoid violent activation movements which result in the probe hitting hard against the preparation model. The adjustment phase also includes the requirement that the spherical surface 14 should be situated below the preparation line around the whole of the model. A check of this kind can be made by rotating the model with the aid of the said manoeuvring members.

The scanning procedure can thereafter be started, and the start is effected by activation of the manoeuvring member 13. On the visual display unit, the "start scanning" mode can thereafter be activated, e.g. by actuating the activation key, the "ENTER"-key, on the computer terminal. The computer and its program thereafter manage the scanning procedure, and the turntable/ holder 5a is rotated and vertically displaced according to a pattern which is determined using the program. The measuring probe systematically scans the surface of the preparation model until it has reached a point above the model, where it stops. When the scanning is completed, the probe automatically performs the said return movement and the table regains its starting height.

Figure 14 shows a menu on the computer screen. The menu comprises an item 1, at which the probe should be set in the starting position according to the above. According to item 2, a check is made to establish that the scanning key 13 is in the "on" position. According to item 3, "ENTER" is actuated on the computer terminal, whereupon a reading is started automatically. The program in the computer delivers or provokes control signals governing the rotation and vertical movement (i.e. lowering) of the holder.

The reading by means of the scanning device and the simultaneously rotating and lowering holder/turntable is read with respect to the contour of the model. Read data is input, in a known manner, into a particular file for subsequent use.

Figure 15 shows an additional menu/form on which the person/dental technician in question can enter various information relating to the scanned tooth. "Type of transfer" can be included here. It is also possible to enter the type of copied material and whether the shape has been determined from a scanned sleeve (either titanium or ceramic) or whether it has subsequently been processed in the computer. The name of the dentist and other data can be entered, such as order number, priority, patient identification, tooth type, etc. A space for remarks can additionally be included. The computer is then activated for "save data file" and the scanning is complete. Information or data which have been scanned and stored in the computer can be transferred, according to the above, to the manufacturer.

Figure 16 shows a scanning function for a sleeve 33 (cap). The inner contour of the sleeve is scanned in accordance with the above, i.e. the outer contour of the preparation model corresponds to the inner contour of the sleeve. This scanning is carried out according to the above. The sleeve is thereafter applied to the model and care should be taken in this respect to ensure that adjustments which have been made for the model are not affected. The sleeve can be glued fast to the model. The system coordinates the two scannings of the inner and outer surfaces by using the same system of coordinates. This means, for example, that the starting position for the scanning device relative to the model must be the same, i.e. the scanning device must be applied to that same point or position which was utilized when only the model was scanned. Once the sleeve has been fixed on the model, the procedure according to the above can be repeated for scanning of the outer contour of the sleeve. The difference is, however, that a difference emerges in the height of the turntable, which must be adjusted. The said manoeuvring members for the turntable can be utilized in this respect. The computer can be arranged to identify automatically the starting point for previous scanning of the surface 2a, which requires that the position for the fixture relative to the turntable has not been altered. On the menu or form from the dental technician, there can be entered supplementary information stating that the scanning relates to an outer surface of a sleeve in question.

The invention is not limited to the embodiment shown by way of example above, but can be subject to modifications within the scope of the subsequent patent claims and the inventive concept.

## Claims

1. Process for scanning, in connection with the production of a tooth, bridge, etc., an outer contour (2a, 33a) of a rotating model (2) by means of a scanning device (6) which operates at a scanning angle (alpha) relative to the rotational axis (2') of the model, characterized in that the model is mounted in or on a rotary holder (5) for the model and the model is supported by the holder such that the scanned contour (2a), above a preparation line (2c) on the model, can be exposed to the angled scanning device, in that the scanning device is directed towards a surface (2e) situated on the model below the preparation line, and in that the holder (5) is activated for rotation (16) and the scanning device (6) is activated for contour scanning, during which contour scanning the scanning device and/or the holder are assigned a movement (15) in the vertical direction of the model.

2. Process according to Patent Claim 1, characterized in that the model is fitted in a fixture (23) and is adjusted in two mutually perpendicular directions (24a, 24b and 27a, 27b respectively) located in the same plane, such that the model is centred relative to the rotational axis of the model, in that the fixture is fitted on or in the holder (5) which is rotatably disposed, and in that the fixture is centred in or on the holder using centring and plumbline members (9, 32).

3. Process according to Patent Claim 1 or 2, characterized in that on the model (2) there is fixed, by means of a member (28), which can be disposed parallel with the rotational axis of the model and which interacts with the model material at the preparation line (2c), [lacuna], in that the contour is installed between the member and the rotational axis such that it can be exposed to the scanning member throughout its scanning movement, i.e. no negative recesses or scanning shadows are present, viewed in the scanning direction (7) of the scanning device.

4. Process according to Patent Claim 1, 2 or 3, characterized in that the contour (2a) is read by means of a reading member exhibiting a spherical front surface (14)/probe, which is brought to bear against the surface (2e) located below the said preparation line (2c) and against the said contour (2a).

5. Process according to any of the preceding patent claims, characterized in that the scanning member is actuated into contact with the said surface (2e) below the preparation line upon the commencement of

the scanning operation, in that the scanning member is assigned bearing contact against the contour (2a) until the scanning member is brought into interaction with the upper part (2h) of the model, whereupon the scanning member is assigned an action in which the interaction of the scanning member with the model contour (2c) ceases.

6. Process according to any of the preceding patent claims, characterized in that the holder (5), during the scanning by the scanning member, is assigned a movement in the vertical direction (15) of the rotational axis, and in that the holder, once the scanning member has completed its scanning of the contour, is assigned a return movement to a starting position.

7. Process according to any of the preceding patent claims, characterized in that, upon the scanning of the contour (2c) by the reading member, a data file is input, which is re-created and used in a data-processing and production procedure, following the scanning function, for the tooth, bridge, etc. in question, which procedure can relate to production in titanium, ceramic, etc.

8. Process according to any of the preceding patent claims, characterized in that it is utilized also on a sleeve (33) applied to the said model, the contour (2a) of the model first being read for establishing the inner surface of the sleeve (33), which inner surface corresponds to the outer contour (2a) of the model, the sleeve is then applied to the model with great accuracy achieved, for example, with the aid of glue or equivalent, after which the outer contour (33) of the sleeve is read in an equivalent manner to the contour (2a) of the model.

9. Process according to Patent Claim 8, characterized in that the front part (14) of the reading member is brought into contact with that surface of the model situated below the preparation line at essentially the same place/point in the readings of the two contours (2c and 33a respectively), any minor adjustment to the vertical direction of the model being able to be made between the readings of the contours.

10. Device for permitting the production of a tooth, bridge, etc. according to Patent Claim 1, in which an outer surface (2a) can be read on a rotating model (2) by means of a reading device (6) which operates at a scanning angle (alpha) relative to the rotational axis (2') of the model, characterized in that a holder (5) is arranged to support the model such that the contour (2a) of the model above a preparation line (2c) on the model can be exposed throughout the reading or scanning from the angled scanning device (6), in that the scanning device can be adjusted in respect of a surface (2e) situated below the preparation line, in that the holder (5) can be activated for rotation and the reading device (6) can be activated for contour reading, and in that the scanning device and/or the holder can be activated for reciprocal vertical displacement movement between the scanning device and the holder.

11. Device according to Patent Claim 10, characterized in that the scanning device is arranged to be actuated into contact with the model upon the commencement of the scanning and to perform a return movement when the scanning device has completed its contour reading, and in that the scanning device (6) and/or the holder (5) are arranged to perform a return movement when the said contour scanning is completed.

12. Device according to Patent Claim 10 or 11, characterized in that the preparation model which can be read using the scanning device is configured having a clearly marked preparation line (boundary) (2c) below which there is preferably configured an indentation of no less than about one millimetre in height (H), calculated in the vertical direction of the model, and having a depth (D) of no greater than about half a millimetre.

13. Device according to Patent Claim 10, 11 or 12, characterized in that a fixture (23) is arranged to support the model such that it rotates around a rotational axis (2') without substantial wobbling, and in that the fixture is configured having manually operated adjusting members (25, 26, 28) for the alignment of the model.

Fig. 1

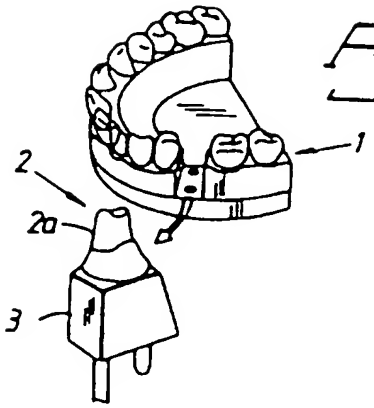



Fig. 2

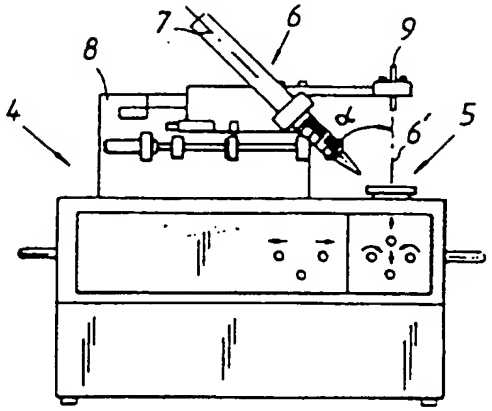



Fig. 3

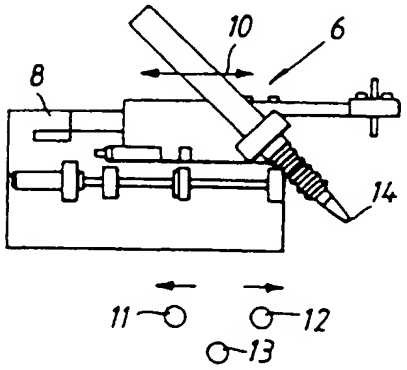



Fig. 4

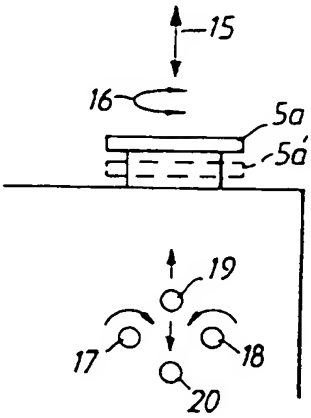



Fig. 5

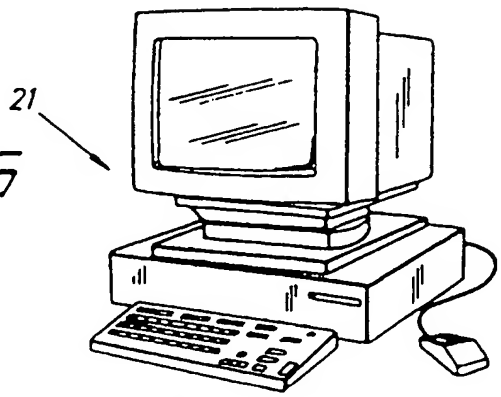


Fig. 6

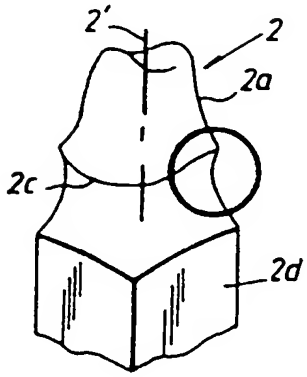



Fig. 7

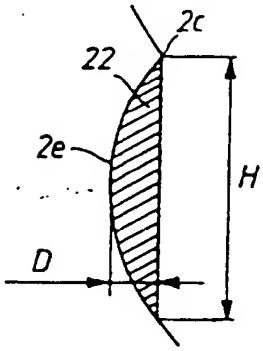



Fig. 8

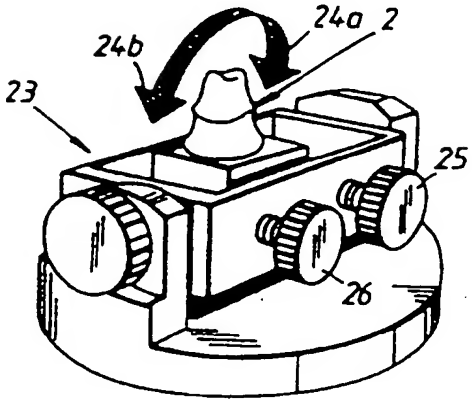



Fig. 9

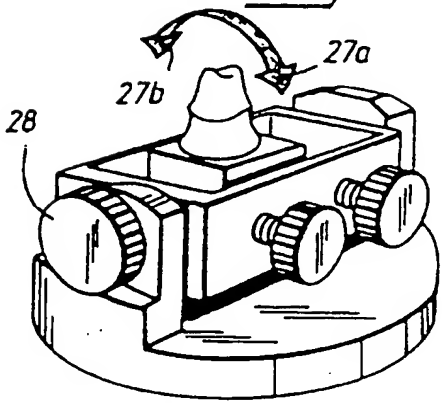
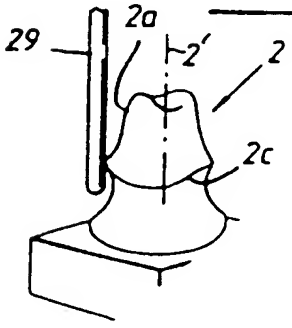



Fig. 10



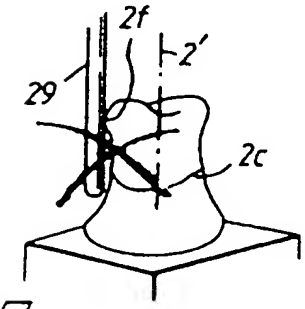




Fig. 10a

Fig.11

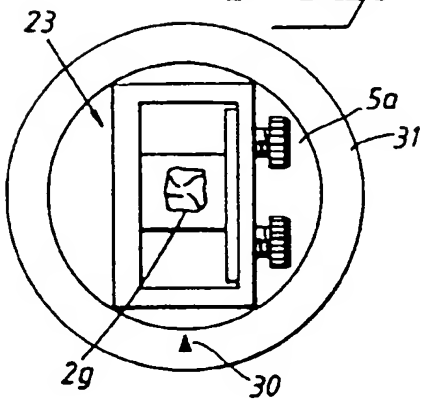



Fig.12

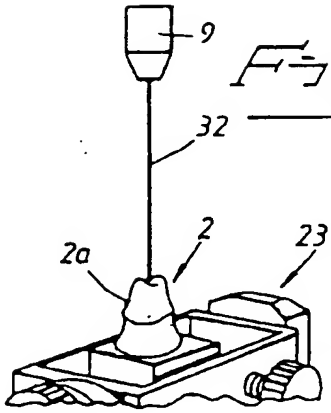



Fig.13

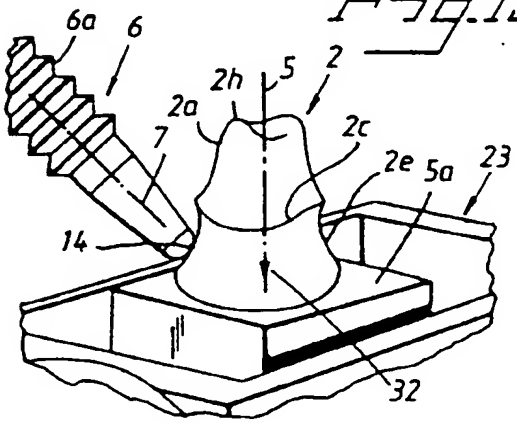



Fig.16

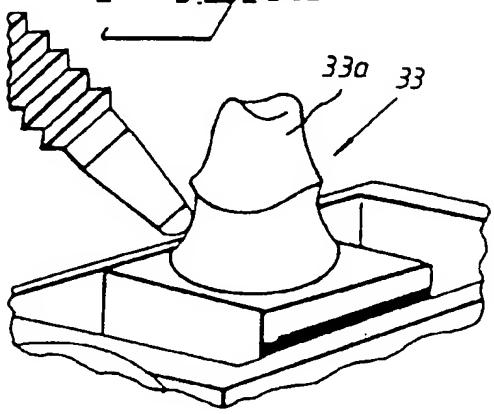



Fig.14

(ESC) Cancel Data = 4231
1. Adjust the probe. Start position!
2. Check that the scanning key is on "ON"
3. Press (ENTER) to start reading.

Fig.15

Operator Patient ID Tooth
Anders 123456-7890 34
Order No. Type of job
P.98.7654 ( ) Titanium
Priority ( ) Ceramic
(o) Titanium CAD
( ) Ceramic CAD
Remarks ( ) Other
Dentist Matts Andersson

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 94 85 0124.2
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## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| A | EP, A2, 0376873 (SHAFIR, AARON ET AL.), 4 July 1990 (04.07.90) -- | 1,10 | A61C 13/00<br>A61C 19/04<br>G05B 19/42 |
| A | EP, A2, 0490848 (NOBELPHARMA AB), 17 June 1992 (17.06.92) -- | 1,10 | |
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TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A61C
G05B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| STOCKHOLM | 18 October 1994 | JACK HEDLUND |

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